Lonesome Wood Vegetation Management Project Decision Notice and FONSI

Appendix C – Amended Grizzly Bear Report, Amended Moose Winter Habitat report and Biodiversity Report

During the comment period for the Environemental Assessmeent, there were a large number of comments related to these Grizzly Bear and Moose habitat. Many of the comments asked very relevant questions that led to the the resource reports being amended. The amended reports are included in this Appendix for the convenience of interested persons.

Grizzly Bear

Issue: Grizzly bears are known to be sensitive to the effects of human activities. The project would involve temporary increases in motorized access values within occupied grizzly bear habitat, and may therefore increase the potential for displacement of bears from important habitat and increase risk of grizzly bear mortality. Other activities associated with fuels treatments also have the potential to displace bears.

Discussion: The Yellowstone grizzly bear population is increasing both in number ((Interagency Grizzly Bear Committee 2003, page 36) and distribution (Schwartz et al. 2002), and has met demographic criteria for recovery since 1998 ((Interagency Grizzly Bear Committee 2003, page 39). As a result, grizzly bears in the Yellowstone Ecosystem were removed from the threatened species list in 2007 and they are now listed as a Forest Service sensitive species on the Gallatin National Forest. Sensitive species are those identified by the Regional Forester for which population viability is a concern, and proposed Forest Service programs or activities are to be reviewed to determine how an action will affect sensitive species (Forest Service Manual 2670.32). Additionally, the grizzly bear is listed as a Management Indicator Species (MIS). MIS are those species whose habitat is most likely to be affected by Forest management activities, and will be monitored to determine population change (USDA Forest Service 1987, page II-18).

The project area is within the Primary Conservation Area, or what was known prior to delisting as the Grizzly Bear Recovery Zone. The project area and adjacent lands provide suitable habitat for grizzly bears. No estimates are available for the number of grizzly bears using the project area, but they are known to regularly occur there.

The project would occur in Management Areas (MA's) 1, 5, 7, 13, and 15. MA's 13 and 15 contain goals and standards specific to grizzly bear habitat (USDA Forest Service 1987, pages III-40, III-41, III-47, III-48). Goals for both MA's 13 and 15 are to manage vegetation to provide habitat necessary to recover the grizzly bear, and to meet grizzly bear mortality reduction goals as established by the Interagency Grizzly Bear Committee. Forest Plan standards for MA 13 pertaining to grizzly bear habitat are:

1. Resource area analysis will identify vegetative characteristic and habitat effectiveness for the grizzly bear.
2. The cumulative effects analysis process and grizzly bear guidelines will provide the basis for managing other resource uses.

3. All vegetative management activities will consider: maintaining or enhancing security for the grizzly bear, vegetative treatment to enhance forest habitat components for the grizzly bear where security will not be jeopardized and there is a demonstrated need to provide openings in Forest cover to increase production of browse species for ungulate prey species or improve whitebark pine nut availability, and enhancing cover where regeneration timber harvest would provide the quickest results for the grizzly bear and its prey.

Forest Plan standards for MA 15 pertaining to grizzly bear habitat are:

1. Grizzly bear habitat improvement, such as prescribed fire, may be scheduled where the need is identified.
2. The cumulative effects analysis process and grizzly bear guidelines will provide the basis for managing other resource uses.

Much of the above MA direction has either been amended out of the Gallatin Forest Plan, or is no longer very relevant compared to more current direction. For example, the grizzly bear guidelines referred to in the MA standards were amended out of the Forest Plan with the recent Forest Plan Amendment for Grizzly Bear Habitat Conservation for the Greater Yellowstone Area National Forests and are no longer applicable. As a result, the Forest Plan Amendment for Grizzly Bear Habitat Conservation for the Greater Yellowstone Area National Forests is largely silent on these topics. Providing secure habitat is still an important component of the Forest Plan Amendment, but it is focused on motorized access values (discussed below) rather than vegetation structure.

Grizzly Bear Mortality Risk and Motorized Access

Grizzly bear/human conflict is the major source of known grizzly bear mortality, and self defense and management removals of bears involved in bear-human conflicts are the two major causes of these types of mortalities. Other sources are illegal kills, electrocution by downed power-lines, mistaken identification by American black bear (*Ursus americanus*) hunters, and vehicle strikes. A primary focus of the grizzly bear recovery effort was management of mortality levels. Management guidelines for managing grizzly bear mortality have been in place for many years, and continue to be an important facet of grizzly bear management now that the species has been de-listed. The most current direction for managing grizzly bear mortality on the Gallatin National Forest comes from the Forest Plan Amendment for Grizzly Bear Habitat Conservation for the Greater Yellowstone Area National Forests (USDA Forest Service 2006, pages A-1 through A-8). It emphasizes several factors including motorized access and secure habitat, livestock, and developed sites. These are some of the human/bear potential conflict factors that National Forest management can influence. Of these, only motorized access and secure habitat are directly related to this project.

Grizzly bears are known to be sensitive to the effects of human access, especially motorized uses. A number of studies addressed the effects of roads on grizzly bears and, to various degrees, universally showed negative impacts (Claar et al. 1999, pages 7.24-7.25). The most common theme seems to be that motorized routes generally displace bears, and they use the habitat adjacent to motorized routes less than areas farther from

these routes. Results vary somewhat with habitat quality, cover availability, traffic volume, season and some other variables. In addition to displacement from habitat by motorized routes, Mace et al (1996) found a relationship between mortality of grizzlies and human activities. From 1988-94, humans killed eight marked grizzly bears in the study area. These deaths were directly influenced by road access through illegal killing and through management removal of bears conditioned to human foods in developed areas.

For these reasons, management of motorized access has long been an emphasis for grizzly bear recovery. The primary focus of access management currently involves providing adequate secure (or core) habitat. Secure habitat is defined as any area >500 meters from an open or restricted (i.e. gated or administrative) motorized access route during the non-denning season and >10 acres in size (Interagency Grizzly Bear Committee 2003, page 146). The purpose of managing for secure habitat is to provide adequate area for bears to meet their biological requirements with low levels of disturbance and interaction with humans. Such areas are especially important to the survival and reproductive success of grizzly bears, especially adult females (Interagency Grizzly Bear Committee 2003, page 43).

The most current direction for access management in grizzly bear habitat on the Gallatin National Forest comes from the Forest Plan Amendment for Grizzly Bear Habitat Conservation for the Greater Yellowstone Area National Forests (USDA Forest Service 2006, pages A-2, A-3). It specifies that within each BMS in the recovery zone, there will be no decrease in secure habitat. Temporary decreases in secure habitat would be allowed, provided that the application rules are applied. The application rules for temporary decreases in secure habitat state that: 1) only one project affecting secure habitat can occur in a subunit at any one time, 2) a project may temporarily decrease secure habitat by up to 1% of the area of the largest subunit within that Bear Management Unit, 3) secure habitat must be restored within one year of the project's completion, and 4) projects must be implemented within 3 years to qualify as temporary.

Open and total motorized access route (OMARD and TMARD) densities are additional grizzly bear habitat parameters evaluated and tracked within the PCA. OMARD values are calculated including roads and trails open to motorized use by the public, as well as those not effectively restricted to public use. TMARD values are calculated including those roads and trails on which motor vehicle use is effectively restricted as well as those open to public use (Interagency Grizzly Bear Committee 1998). There are no standards for managing OMARD and TMARD within the recent Forest Plan Amendment for Grizzly Bear Habitat Conservation, but the Forest Service is required to monitor OMARD >1 mi/mi^2 and TMARD >2 mi/mi^2 for each BMS within the PCA (USDA Forest Service 2006, page 10).

The Yellowstone Grizzly Bear Recovery Zone was divided into Bear Management Units to be used for habitat evaluation and population monitoring (USFWS 1993, page 17). Bear Management Units were further subdivided into Bear Management Subunits (BMS's) to allow better resolution of habitat measurement (Interagency Grizzly Bear

Committee 2003, page 17). The project area lies within the Henry's Lake #2 BMS. Portions of this BMS have high densities of motorized access routes resulting from access on private lands and past timber harvest activities. As a result, the Henry's Lake #2 BMS was identified in the Grizzly Bear Conservation Strategy as a subunit needing improvement in motorized access values (Interagency Grizzly Bear Committee 2003, page 41).

The project area is characterized by an abundance of open and restricted motorized access routes, most of which were originally constructed to facilitate timber harvest but which are now used primarily for recreational and administrative uses other than timber harvest. Open and total motorized access values are both high, and secure habitat is found in only a few small, scattered pieces within the project area. The project area provides many of the elements necessary for quality habitat, but grizzly bears likely make less use of this habitat than would otherwise be expected if the effects of motorized access were not considered.

Effects of motorized access

Approximately 4 miles of temporary roads would be constructed to facilitate timber harvest under Alternative 2. Under alternative 3, there would be slightly fewer temporary roads constructed compared to Alternative 2. None of this temporary road would be constructed within grizzly bear secure habitat, although due to the 500 meter buffer around motorized access routes (that excludes these areas from designation as secure habitat) some of the few existing pieces of secure habitat within the project area would be temporarily reduced or eliminated. This includes an approximately 16 acre piece (Figures 2 and 3) of secure habitat between Trapper and Moonlight Creeks which would be temporarily eliminated due to temporary roads needed for harvest activity (Units 7, 11, and 12 in alternative 2 and Unit 11 only in alternative 3). Additionally, an approximately 164 acre piece (Figures 2 and 3) of secure habitat between Rumbaugh and Spring Creeks would be temporarily reduced to about 157 acres due to two pieces of temporary road needed to facilitate harvest in Unit 21 under alternatives 2 and 3. These temporary reductions are not enough to affect the amount of secure habitat available at the scale which it is typically tracked (which is to the tenth of a percent of a BMS) (Table 1). Both alternatives would therefore be in compliance with the application rule specifying that temporary reductions in secure habitat cannot exceed 1% of the area of the largest subunit within the BMU the project occurs in.

The application rules for temporary reductions in secure habitat would be applied such that secure habitat temporarily reduced by the planned temporary roads would be restored within one year of completion of harvest activities in those units, and implementation of harvest activities in those units would last no longer than 3 years. These measures would apply to temporary roads and harvest activities in Units 7, 11, 12, and 21 under alternative 2 and Units 11 and 21 only in Alternative 3.

To ensure compliance with the application rules, project implementation would be coordinated with the Caribou-Targhee National Forest so that there would be only one project temporarily affecting secure habitat at a time within the Henry's Lake #2 BMS.

Currently, no additional projects are planned on National Forest lands involving temporary reductions in secure habitat within this BMS (Bryan Aber, personal communication, 2/25/08). Both alternatives would be in compliance with all Forest Plan direction for access management and temporary reductions in secure habitat.

Because public motorized use of temporary roads would be effectively restricted during the period of operation, temporary roads were included in the calculation of TMARD but not in the calculation of OMARD. Therefore, there would be no change in open motorized access route densities under any alternative. Under Alternatives 2 and 3, most temporary roads would be constructed within areas where total road densities already exceeded 2 miles/mile^2, although there would be a small increase (approximately 1.0%) in the area where TMARD exceeded 2 miles/mile^2. These temporary changes would occur on the east side of the Henry' Lake #2 BMS, where grizzly bear habitat use would likely be compromised under any alternative by high levels of motorized access.

Small changes in motorized access values along with related vegetation management activities under Alternatives 2 and 3 could lead to some increased potential for displacement of bears from the project area relative to the no action alternative. Most of the habitat in the project area would already be heavily affected by motorized access, and the small changes in TMARD resulting from the project under Alternatives 2 and 3 would have relatively little influence on how grizzly bears currently use the habitat in this area or grizzly bear mortality risk. Secure habitat affected by project activities would be restored within one year of completion of these activities, and would not last longer than three years. Blocks of secure habitat approximately 9,600, 19,300, 860, and 450 acres in size would be available adjacent to the project area (Figure 1) and would be unaffected by any project alternatives (Figure 1). Grizzly bear home ranges are large, and these large pieces of secure habitat on the west side of the BMS are in close enough proximity to be available for use by any bears that might be displaced by project activities over the life of the project. Vegetation in these areas contains many similar elements as those found in the project areas such as mixed conifer forests and open meadows. Higher elevation areas within secure habitat also contain large whitebark pine stands that provide important fall food sources for grizzly bear during years of high cone production. In contrast, although scattered individual whitebark pine trees are present in the project area, there are no significant cone-producing stands because the project area is below the lower elevation limit where whitebark pine competes well with other species. Therefore, the effects of these changes in motorized access values along with other project activities would be of limited duration rather than permanent, and the potential for increased grizzly bear mortality resulting from this project would be very low. MA 13 and 15 goals for grizzly bear mortality would be met.

Habitat Alteration

The most important foods available to grizzly bears in the Greater Yellowstone Area (GYA) are meat (primarily ungulate carrion and elk calves), whitebark pine nuts, army cutworm moths, and cutthroat trout (Interagency Grizzly Bear Committee 2003, page 45-46). Conservation efforts for grizzly bears in the GYA are currently focused on the management and monitoring of these food sources,

because they are so important that bear-human conflicts and bear mortality both increase during years of low availability of one or more of these sources (Interagency Grizzly Bear Committee 2003, pages 45-46). Army cuttworm moths are utilized by bears primarily in the eastern portion of the ecosystem and cutthroat trout are important primarily around Yellowstone Lake in Yellowstone National Park. Therefore, meat and whitebark pine nuts are probably the most important foods available to grizzly bears in the northwestern portion of the ecosystem, where the project area is located. There are no whitebark pine stands located within any treatment unit because the elevation is too low. Therefore, there will be no effect to this food source. Elk are the most abundant ungulate in the project area. The project is not expected to appreciably affect availability of elk under any alternative (Elk Report, Pils 2007b).

Despite the importance of meat and whitebark pine, grizzly bears are an omniverous species that also utilize a wide variety of plants. Riparian vegetation and plant roots are of lower forage value than ungulate meat or whitebark pine nuts but are also utilized by grizzly bears throughout the spring, summer, and fall because they are widely available. Some increased grass, forb and shrub production may occur under Alternatives 2 and 3 in areas where the forest canopy is opened, although many stands may not be opened enough to stimulate growth of palatable forage plants given the amount of thinning proposed. Berry bushes also provide a seasonal food source as well. Huckleberries, buffalo berries, choke cherries, and others are found in the project area and are known to be utilized by bears. While project activities may damage some individual bushes, the thinning proposed under Alternatives 2 and 3 would be expected to favor these species by opening the canopy. Overall effects on grizzly bear forage under Alternatives 2 and 3 are expected to be slightly beneficial (EA, Appendix A, pp. 42).

Most of the project area is heavily forested and dominated by mature to old forest stands (see Vegetation report, Novak 2007). As a result, secure hiding cover for grizzly bears is abundant. The Vegetation report (Novak 2007) concluded that the project would have very little effect on current structural diversity (i.e., the project area would remain dominated by mature to old forest). When this is considered along with the fact that providing secure vegetation cover has been de-emphasized in recent grizzly bear habitat management direction, the effects of all project alternatives on grizzly bear security would be discountable and MA standards would be met. Both alternatives would be consistent with the MA 13 and 15 goal of managing vegetation to provide habitat necessary to recover the grizzly bear.

Summary

All alternatives would be in compliance with all Forest Plan direction for grizzly bear habitat, including motorized access management. The effects of Alternatives 2 and 3 on grizzly bear mortality risk and habitat displacement are expected to be very limited. Small increases in grizzly bear forage could result from vegetation treatments proposed under Alternatives 2 and 3. Therefore, this issue can be dismissed due to minor effect and effective mitigation. The Biological Evaluation determination for Alternative 1 is

"*no impact*". For Alternatives 2 and 3 determinations are "*may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or cause a loss of viability to the population or species.*"

Table 1. Motorized access values in the Henry's Lake BMS under the no action alternative along with alternatives 2 and 3. OMARD values were not shown because they did not change among alternatives.

Alternative	Secure	TMARD (> 2 mile/mile^2)
No Action	45.7%	28.3%
Alternative 2	45.7%	29.1%
Alternative 3	45.7%	29.1%

Recommended mitigation and /or Alternatives

1. No public motorized use of temporary roads constructed for this project would be allowed (all alternatives).
2. Secure habitat temporarily reduced by project activities would be restored within one year of completion of those activities. This would apply to temporary roads and harvest activities in Units 7, 11, 12, and 21 under alternative 2 and Units 11 and 21 only in Alternative 3.
3. Implementation of project activities temporarily reducing secure habitat would last no longer than 3 years (alternative 2 only). This would apply to temporary roads and harvest activities in Units 7, 11, 12, and 21 under alternative 2 and Units 11 and 21 only in Alternative 3.
4. Project implementation would be coordinated with the Caribou-Targhee National Forest so that there would be only one project temporarily affecting secure habitat at a time within the Henry's Lake #2 BMS.

Literature Cited is in the EA, Appendix A.

Moose Winter Habitat Effects Report

Moose on the east side of the Henry's Lake Mountains utilize a narrow band of habitat at the lower elevations along the shoreline of Hebgen Lake during the winter. Habitat important to moose within this area includes old lodgepole pine stands with subalpine fir understories. Fuels treatments in such stands may alter moose habitat to unsuitable condition by removing subalpine fir trees that are preferred browse, and/or by opening the canopy which would allow greater accumulation of snow.

Indicator
Compliance with the applicable Gallatin Forest Plan standards (covered below) will be used as the indicator for this issue.

Affected Environment

Moose are an ecologically unique native species on the Gallatin National Forest. They are considered highly charismatic by many people, and the opportunity to view this species is very important to recreationists (including summer home owners and permittees) within the project area. They are commonly observed around Hebgen Lake during the summer months when recreational use of the area is heaviest. Additionally, this moose herd provides some opportunity for hunters each year. Montana Fish, Wildlife, & Parks is the agency responsible for management of moose and other big game populations in the state of Montana, including on National Forest lands. Part of their management program includes monitoring and development of objectives for many big game populations. However, there is no moose population estimate for this area as no surveys have been conducted in recent years, and no population objective has been developed. Moose are typically much more difficult to survey for than most other big game species in Montana because they spend considerable time in heavily forested areas where they are difficult to observe from the air. However, data from harvest surveys and general observations indicate a declining population trend over the past 15-20 years. As a result, moose viewing opportunities have declined and moose hunting permits for this area have been cut substantially over this period with only 3 permits for bull moose allocated annually in recent years.

Winter is a critical time of year for moose because forage quality and availability is low, and energetic costs of moving through deep snow and maintaining body heat in cold temperatures are high (Canfield et al 1999, pages 6.3-6.6). Unlike ungulates in the northern Rocky Mountains that migrate to lower elevation valleys with little snow accumulation, moose often remain at higher elevations with greater snow accumulation. Winter habitat for moose is variable across their range, but always includes concentrations of accessible browse. Willow and aspen are among the most palatable browse species to moose. These habitats are often heavily used if snow conditions allow. At snow depths of around 30”-40”, moose will shift from open browse fields to dense stands of conifers where snow depth is ameliorated by canopy cover and shading reduces crusting of snow. In the Greater Yellowstone Area, older lodgepole pine forests with subalpine fir understories were found to be heavily used by moose under such conditions. Subalpine fir is a preferred browse species for moose. Moose select patches with high concentrations of browse to minimize energetic costs of feeding (i.e., large quantities of forage can be consumed with little movement). Snow depths exceeding 45-50” will preclude moose use altogether.

Moose response to habitat disturbance varies substantially across their range. In many areas, early successional conditions created by fire or logging are beneficial because they result in vigorous regeneration of palatable browse species. However, the relationship of moose to ecological disturbances in the Greater Yellowstone Area appears to be different. In this area, older lodgepole pine stands are among the most important wintering areas, especially under severe conditions when moose are the most vulnerable. When subject to disturbance, these stands typically regenerate with high densities of lodgepole pine seedlings rather than palatable woody shrubs. These stands do not provide winter habitat

for moose until shade tolerant subalpine fir saplings begin to achieve adequate densities under the aging lodgepole pine canopy. To illustrate this point, Tyers found little or no moose use of lodgepole pine stands <100 years old, and highest use of lodgepole pine stands >300 years old during mid-late winter (Tyers 2003, p.86-101). He also reported a precipitous decline in the Northern Yellowstone moose population following the 1988 fires (Tyers 2003, p.32), which burned approximately 35% of the study area and 29% of the mature forest in the study area (Tyers 2003, page 79). The loss of subalpine fir browse and canopy cover to ameliorate snow depth were the factors deemed responsible for causing this decline.

Applicable Laws, Regulations, Policy and Forest Plan Direction
The Gallatin Forest Plan contains management direction for big game winter range. There is a Forest-wide standard specifying that "big game winter range will be managed to meet the forage and cover needs of deer, elk, moose, and other big game species in coordination with other uses (USDA Forest Service 1987, page II-18)." Additionally, much of the project area is within Management Area 13 which contains a standard that vegetative management practices will be used to maintain and improve the quality and quantity of big game forage and provide for a diversity of habitat for other wildlife species (USDA Forest Service 1987, page III-41).

Methodology for Analysis
To analyze the effects of proposed treatments on moose winter range, the spatial extent of moose winter range in timber compartments 709 and 710 was plotted using the ArcView 3.2 Geographic Information System program. Montana Fish, Wildlife, & Parks data was used to define moose winter range in this area. Next, queries of the Timber Stand Management Record System (TSMRS) database were conducted to identify stands that are currently in suitable condition for moose winter habitat.

The queries conducted were for late successional lodgepole pine and subalpine fir stands because these are the stands most important to moose when environmental conditions are difficult (i.e., when snow is deep and/or crusted). In addition, although other vegetation types may be heavily used by moose during winter (such as willows) the proposed treatments would not affect these stands. One category of stands identified were those in the subalpine fir series, currently in lodgepole pine or subalpine fir cover types, and which met old-growth criteria (defined as >150 years of age and at least 12 trees/acre >10" diameter). While the size of trees in the stand is unimportant from a moose habitat perspective, this criterion was included because the queries had already been run for other issues associated with this project, and it was judged that there would be few stands meeting the age criterion but not the diameter limit (Mark Novak, personal communication, 05/04/07). These stands had stand exam data sufficient to have high confidence that they are actually in the condition specified by the data, and therefore were considered to provide suitable moose winter habitat. Another category of stands identified were those that were likely to provide suitable moose winter habitat. These stands had characteristics similar to those meeting old growth criteria, but lacked stand exams to verify their current condition.

Once currently suitable habitat was identified, the proposed treatment units were overlayed onto the stands currently in suitable condition for moose winter range to identify which stands would be altered to an unsuitable condition for moose winter range. The estimated amount of winter moose habitat in suitable condition before and after the proposed treatments was then compared. Stands that had previously been harvested were also identified and overlayed for the cumulative effects analysis.

Direct and Indirect Effects Analysis

Direct and Indirect Effects of Alternative 1 (No Action Alternative)

Under this alternative, there would be approximately 1,760 acres of stands in compartments 709 and 710 providing suitable winter range for moose (Figures 1). With no treatment, these stands would continue to provide suitable habitat until a disturbance event eventually occurred. Given the current condition of these stands, stand replacement fire(s) would likely occur at some point in time. Such stand replacement fires would convert vegetation conditions to early successional stages that would not provide suitable winter habitat for moose. Although stand replacement fires in this area are probably inevitable at some point in time, there is no way to know how much of the suitable moose habitat would be burned across time through such events until they actually occur.

Cumulative Effects of Alternative 1

The moose winter range in compartments 709 and 710 were used as the analysis area for cumulative effects. This area was used because it is the primary winter range available to moose occupying the east side of the Henry's Lake Mountains. The temporal bounds for the cumulative effects analysis was from approximately 1960 to 5 years in the future. The year 1960 was selected because this is approximately when the first timber harvest activity occurred at magnitudes that would affect moose winter habitat. Five years into the future was used because this is the approximate extent of any reasonably foreseeable future activities.

Approximately 2,300 acres of subalpine fir series stands with lodgepole pine cover type experienced some sort of harvest activity in the analysis area from approximately 1960 to the present, including most of the stands along the lakeshore in the southern part of the project area. These stands were probably some of the most important for moose winter range because they are located adjacent to other important moose winter range vegetation types such as willow and aspen stands, and because they are at the lowest elevations where snow depth would be lowest. Much of this harvest occurred during the 1980's, shortly before moose population declines in the area were first noticed. Harvest activity included both clear cuts and different types of intermediate cuts. Although many of these stands are now maturing, they have not yet reached advanced successional stages that would provide quality moose winter habitat. Past harvest activity has likely been a factor in the moose population declines observed within the analysis area.

Fuels reduction activities have occurred on Forest Service permitted recreation residences. These areas are of relatively low habitat value to moose during the summer season when residences are occupied, due to the high level of human activity that occurs.

During the winter months when residences are typically unoccupied these areas may provide some useable habitat for moose, however recreation residence lots are generally maintained in a condition such that the late successional characteristics desirable to moose during deep snow conditions are lacking. Therefore, the effects of fuels reduction activities are probably very low.

Disturbance to wintering moose from recreational users may also be a factor in the declining population trend observed for moose in this area. The area receives regular snowmobile use on the Hebgen Lake Road, which bisects important moose winter habitat. Under the recently completed Gallatin National Forest Travel Plan decision, a portion of the Trapper Creek and Moonlight Creek drainages would be closed to snowmobile use in order to minimize disturbance to wintering moose in this area.

Direct and Indirect Effects of Alternative 2

As described above, Tyers (2003, page 32) noted a precipitous decline in moose populations in the Northern Yellowstone winter range after large-scale fires burned approximately 29% of the mature forest in his study area. However, these fires were stand replacement events. The fuels treatments proposed under this alternative would involve thinning of the understory and/or overstory rather than complete stand replacement. No data is currently available on the effects of such treatments on moose. However, given what is known about moose winter habitat selection, some inferences can be made on how moose would respond to treatments.

Commercial harvest units would involve a mixture of larger overstory trees and smaller understory trees being removed. This would result in subalpine fir browse availability being reduced, and foraging opportunities for moose would be low. As described earlier, moose select patches with high densities of browse during winter to reduce energetic costs of feeding while maximizing forage intake. Additionally, partial overstory removal would alter snowpack characteristics as well. Less snow would be captured by the canopy, causing snow to accumulate more and increasing energetic costs of locomotion.

The effects of understory thinning and prescribed burning would be similar to those for commercial harvest in that availability of subalpine fir browse would decrease such that stands would provide low-quality foraging opportunity for moose during deep snow conditions. However, the overstory would not be altered and snowpack conditions would not change from the current situation.

Under the proposed action, approximately 16% of the estimated late winter moose habitat would be commercially harvested, 7% would be subject to understory thinning, and >1% would have pre-treatment and prescribed fire. A total of about 23% of the estimated suitable moose winter habitat would therefore be subject to treatment, and in these areas vegetation would be converted to low-quality habitat for moose during deep snow conditions (Table A). These effects would be exacerbated by the fact that the treatments would be concentrated in the lowest-elevation portion of the winter range. Because snow depth increases with elevation, these areas are likely to be those most important to moose during winter and especially during deep snow conditions.

Logging activities would be restricted from December 1-May1, so disturbance to wintering moose from project activities would not be expected.

Table A. Acres of suitable moose winter habitat to be treated by 3 methods under the project alternatives.

Suitable Habitat	Alt 1 (acres)	Alt 2 (acres)	Alt 3 (acres)
Proposed for harvest	0	280	125
Proposed for understory thin	0	120	100
Proposed for burning	0	5	5
Remaining suitable habitat post-treatment	1,760	1,355	1,530

Cumulative Effects of Alternative 2
The conversion of late winter moose habitat to low-quality habitat under this alternative would be additive to previous timber harvest activities already described for alternative 1. Cumulative effects on moose winter habitat and the resulting availability of forage during deep snow periods would be expected.

Direct and Indirect Effects of Alternative 3
The direct and indirect effects of alternative 3 would be similar to those described for alternative 2, except the magnitude would be lower. Approximately 13% of the total estimated late winter moose habitat would be treated (Table A) and therefore converted to low-quality habitat for moose during deep snow conditions.

Logging activities would be restricted from December 1-May1, so disturbance to wintering moose from project activities would not be expected.

Cumulative Effects of Alternative 3
The cumulative effects of this alternative would be lower than those expected under alternative 2 due to the lower number of acres treated. The Cumulative Effects checklist for Moose Winter Habitat is in the project file.

Summary Conclusion
Both action alternatives would lead to a decline in the availability of late winter moose habitat. Because winter nutrition is a primary factor driving moose population dynamics, and because winter nutrition may already be a limiting factor for this population, both alternatives may contribute to continued moose population declines in the analysis area. The magnitude of these effects would be considerably larger under alternative 2 compared to alternative 3. The Forest Plan MA 13 standard and Forest-wide standard for big game habitat referrenced above would both be met under all alternatives. All habitat alterations, whether natural or anthorpogenic, result in positive effects to some species and negative effects to others. For this project, while there would be adverse effects to

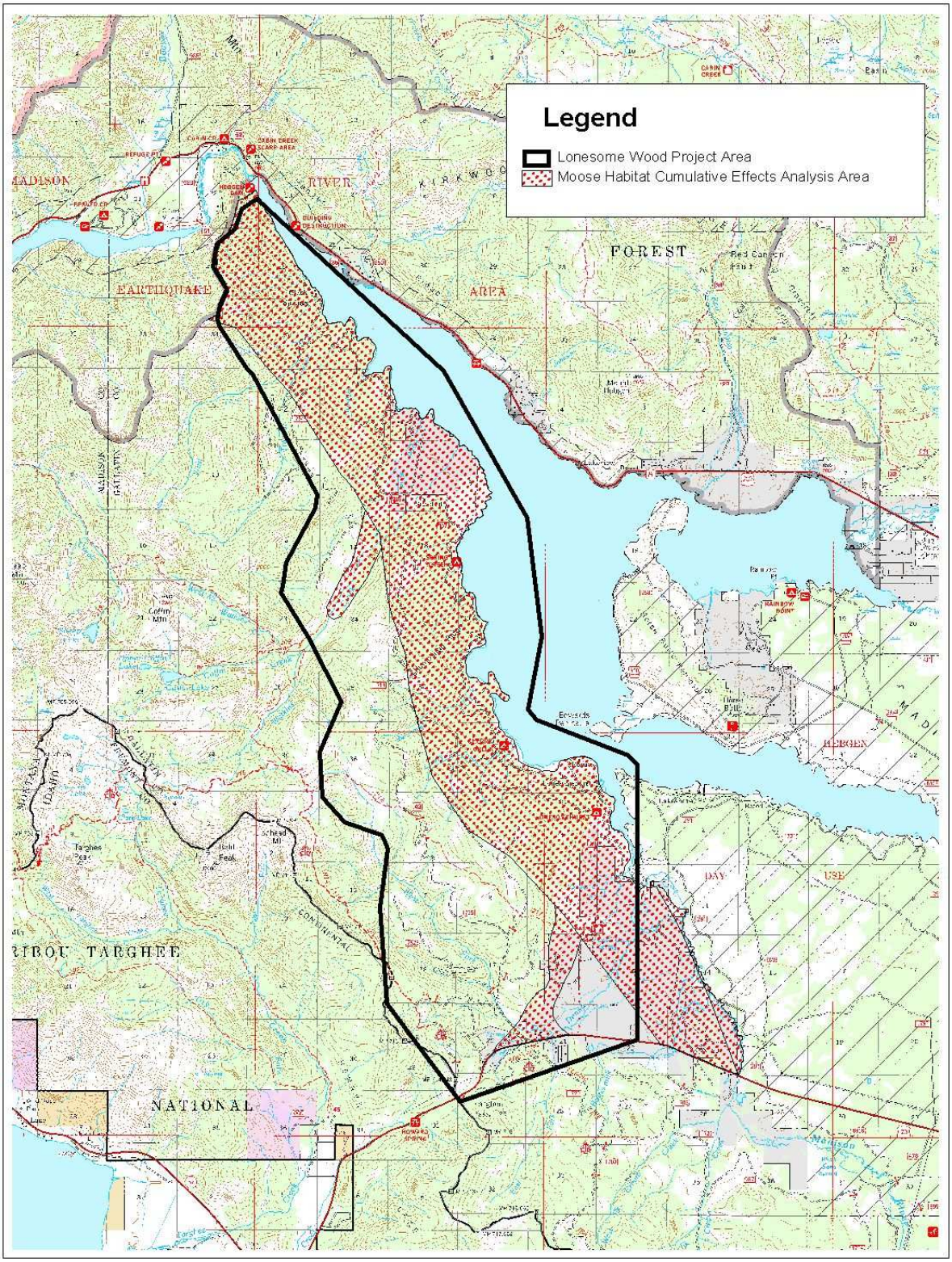
late winter moose habitat, the aspen restoration component of the project would improve habitat quality for deer, elk, and many other wildlife species as well as moose outside of the late winter period.

Under either alternative, moose are not expected to be at risk of extirpation at either the local or larger levels. At the local scale, approximately 1,300-1,500 acres of late winter moose habitat would remain under Alternatives 2 and 3 (table 1). This would be adequate to maintain a viable population in the project area. Montana Fish, Wildlife, & Parks continues to administer a hunting season on moose in this area in which 3 permits for bull moose are allocated annually. Moose permits would no longer be allocated for this area if the viability of the population were a concern. At larger scales, moose have a large distribution throughout western Montana and the Greater Yellowstone Area, and are hunted throughout this area (with the exception of National Parks). Moose in the Greater Yellowstone Area and across North America are not considered at risk of extirpation.

Monitoring and Monitoring Requirements
No monitoring of winter moose habitat is planned for this project. Inadequate resources (staffing, funding) are available given other Forest priorities to properly conduct monitoring of habitat or moose population response.

Literature Cited is in the EA, Chapter 4.

Figure A. Cumulative effects analysis area map for moose winter habitat issue.



Biodiversity Report

Introduction: This report addresses the potential for project alternatives to affect biodiversity by impacts to key habitats including aspen, snags and dead/downed woody material, and old growth.

Discussion: Biodiversity can be defined as the variety of life or variability of living organisms, including the variability between ecosystems. Locally, there are many elements that contribute to biodiversity including the multitude of wildlife species that utilize the Greater Yellowstone area. It is impossible to analyze them all in a single report. Instead, this report focuses on 3 key elements of biodiversity and how the species dependant on these habitats that could be affected by the project. These are aspen forest, snags and downed woody material, and old growth.

Aspen

With the exception of riparian areas, aspen is considered the most biologically diverse ecosystem in the Intermountain West. This habitat group may occur within any of the grassland or forested types. Aspen, a deciduous tree, contributes to ecological diversity and supports a variety of plant associations. Shepperd and others (2006) suggest that aspen serve as oases for plant and animal diversity.

Aspen stands provide important habitat for many species of wildlife (DeByle 1985, Johnson 2005). Aspen provides forage, cover, shade, and nesting habitat for birds, small mammals, big game, and forest carnivores. Aspen provides habitat for many species of birds, some of which utilize the stand year-round while others use aspen during only a portion of the year (DeByle 1985). Birds breeding in aspen stands include shrub or tree canopy nesters, cavity nesters, or ground nesters. Aspen trees offer more structural diversity than conifer forests (Johnson 2005). Snags provide perches for birds of prey and sites for cavity nesters.

Aspen emphasizes vegetative reproduction over sexual reproduction and occurs in clones or groups of genetically unique individuals. Aspen's dependence on a disturbance regime from wildfire or an avalanche has been documented by many authors (Shepperd and others 2006). Aspen clones sprout suckers (individual stems called ramets) after a disturbance promotes regeneration. The mechanism that causes ramet growth is a hormonal response to apical meristem mortality (Shepperd and others 2006). Historically, fire enabled aspen to out-compete taller, shade-tolerant species and aspen has a distinct advantage with the clonal reproduction (Johnson 2005). Aspen may only persist if they are able to maintain open light under a canopy of conifers. Fire return intervals of 20 to 130 years are necessary to maintain aspen, and as fire cycles lengthen, aspen is eliminated. Grass, forbs, shrubs, or conifers replace aspen in the absence of fire (Jones and DeByle 1985).

Aspen generally occurs in the project area in relatively small, isolated clones although some larger stands exist in places as well. The relative health of the aspen is variable

with some clones expressing a diversity of age and structure and other stands appearing as single storied and over-mature due to colonization by conifers. Many aspen stands are currently decadent and declining as they are invaded by conifers on the edges of grasslands, within conifer dominated stands, or where associated with riparian areas.

The Hebgen Basin Watershed Risk Assessment was prepared in 2005 to identify risks to different resources in the analysis area (including the entire Lonesome Wood project area) and whether or not opportunities exist for vegetation management to reduce these risks. The risk assessment concluded that aspen habitats are at risk within the analysis area and at larger scales, and that opportunities for maintaining or regenerating aspen stands would be beneficial (USDA Forest Service 2005).

Under Alternative 1 (no action), many of the smaller, isolated aspen clones would continue to become decadent and replaced by conifers in the absence of a major disturbance event such as wildfire. Alternatives 2 and 3 would treat approximately 1,285 and 1,405 acres of units containing aspen stands. The actual acreage of aspen treated would be less than that, as not all of the acres within these units contain aspen. Existing aspen clones within these treatment units would be maintained and expanded by removing competing conifers.

Snags

Many species, such as most cavity nesting birds, are depedant on snags for fulfilling one or more critical life history functions such as feeding or breeding. Dudley and Vallauri (2004) pointed out that snags and down wood are another important component of biodivesity.

Timber harvest and associated fuels treatments can limit the availability of snags and down wood unless harvest operations are specifically designed with retention of such components in mind. Dudley and Vallauri (2004) also made recommendations on how forest management practices should be designed to include retention of snags and downed wood. These recommendations were general in nature, and focused on heavily managed European forests. Much of the discussion in this report is not applicable to the Lonesome Wood project because of the vastly different conditions between the heavily managed European forests discussed in this report, and the forest types found on the Gallatin National Forest. Much of the Gallatin National Forest consists of large wilderness and roadless areas where active forest management is not practiced, and where snags and downed wood are abundant. An example is the Lionhead Recommended Wilderness Area which is immediately adjacent to the Lonesome Wood project area. However, the general conclusion of this report that snags and downed wood are an important component of biodiversity and need to be provided for during forest management planning are still valid.

The goal of Forest Plan Amendment #15 was to "maintain sufficient snag habitat components to accommodate the needs of cavity nesting birds and other snag dependant species in conjunction with timber the harvest program (USDA Forest Service 1993)." It contains standards for retention of snag and down woody debris applicable to timber

harvest (USDA Forest Service 1993). The EA prepared for Forest Plan Amendment #15 concluded that the standards would "maintain habitat for snag using and cavity nesting species and dead and down debris using species in harvested areas (USDA Forest Service 1993)."

Based on a broad-scale look (by Ranger District and Madison mountain range using FIA derived data) presently there are about 12 snags greater than or equal to 10" dbh per acre in the Madison Range and around 11 per acre for the entire Hebgen Lake Ranger District (Mark Novak, personal communication). Based on field reviews and stand exam data the two timber compartments (709 and 710) encompassing the project area exceeds the 30 snags per 10 acres > 10"dbh from Forest Plan Amendment #15 (Mark Novak, personal communication). The project area and surrounding landscape has recently experienced an outbreak of Douglas fir beetle which has killed hundreds of mature Douglas fir trees in and around this area. A mountain pine beetle outbreak has also led to the recruitement of many whitebark pine and lodgepole pine snags in these two timber compartments. Past logging throughout the area has not reduced snags levels below the Forest Plan standard. Additionally, as fire and insects continue to kill trees, snag numbers are expected to increase.

Snag levels within harvest units would be reduced somewhat from the current condition under Alternatives 2 and 3. However, harvest prescription would be designed to retain adequate snags and down woody debris to meet Forest Plan Amendment #15. Given the recent mortality of trees due to insect outbreaks as discussed above, snag availability in the project area and surrounding landscape outside of harvest units would be expected to increase. The effects of all project alternatives on snag dependant wildlife would be discountable, and their habitat needs would continue to be met.

Old Growth

Old growth forests are an additional valuable component of biodiversity. Some species are dependant on different old growth forest types for the unique attributes they possess such as complex structure.

The Gallatin Forest Plan contains a standard for old growth in MA 13 (USDA Forest Service 1987, page III-41). It specifies that a minimum of 30% old growth be maintained in each timber compartment. Currently, compartment 709 does not meet this standard with only 21% old growth present while compartment 710 well exceeds the standard at 43% old growth (see vegetation effects report). Under Alternatives 2 and 3, no old growth would be treated in compartment 709. In compartment 710, approximately 495 and 230 acres of old growth would be treated under Alternatives 2 and 3, respectively. Approximately 39% of compartment 710 would be old growth under Alternative 2 while 41% would be old growth under Alternative 3. Therefore, Forest Plan standards for old growth would be met in compartment 710 under all alternatives, and in 709 they would not be met but no alteration of old growth would occur.

On the Gallatin National Forest, there are two Management Indicator Species (MIS) for old growth forests: the pine marten, for mesic spruce forest types; and the northern

goshawk, for dry Douglas-fir forest types (USDA Forest Service 1987, page II-18 to II-19). The effects to these species were discussed in separate reports prepared for this project. In summary, while some reduction of habitat for pine marten would occur at the project area scale under all action alternatives, the reports for both species concluded that abundant habitat exists for these species at larger scales (i.e., the Forest and Regional levels). This is a reflection of the large amount of late successional forest currently available relative to historic conditions at multiple scales across the Northern Region.

In summary, old growth standards for the two timber compartments within the project area would either be met or not affected by project alternatives. Adequate old growth habitat would therefore be retained at the local scale. The analysis prepared for old growth MIS (pine marten and goshawk) concluded that abundant old growth habitat exists at the Forest and Regional scales for these species. Therefore, effects to old growth dependant species would be very limited at all scales.

Summary

The three important components of biodiversity analyzed in this report would be maintained in the project area through compliance with Forest Plan standards under all alternatives. Additionally, aspen would be enhanced by the proposed treatments under alternatives 2 and 3. The project would have discountable effects on biodiversity and this issue can be dismissed due to minor effect.

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